Site Need Statement

General Reference Information	
1 *	***Need Title*:** Value of Information Decision Analysis for Tank Farm Closure
2 *	***Need Code*:** RL-WT069
3 *	***Need Summary*:** An approach is needed for determining when enough information on waste retrieval performance, closure technology, and vadose zone conditions has been gathered to support decisions on closure. Additionally, given the uncertainty associated with many of the parameters used in modeling waste site and closure scenario performance, it is important to develop and demonstrate capabilities for probabilistic modeling. Probabilistic modeling approaches support the conduct of sensitivity and uncertainty analyses and incorporate parameter distribution ranges. This helps to bound the risk analysis and determine where additional data or information is needed to reduce uncertainties in parameters that drive risk assessment outcomes.
4 *	***Origination Date*:** FY 2000
5 *	***Need Type*:** Technology Need
6	***Operation Office*:** Office of River Protection (ORP)
7	***Geographic Site Name*:** Hanford Site
8 *	***Project*:** Closure PBS No: RL-TW11
9 *	***National Priority:*** _X_ 1. High - Critical to the success of the EM program, and a solution is required to achieve the current planned cost and schedule. ____ 2. Medium - Provides substantial benefit to EM program projects (e.g., moderate to high life-cycle cost savings or risk reduction, increased likelihood of compliance, increased assurance to avoid schedule delays). ____ 3. Low - Provides opportunities for significant, but lower cost savings or risk reduction, may reduce the uncertainty in EM program project success.
10	***Operations Office Priority*:** High
Problem Description Information	
11	***Operations Office Program Description*:** The overall purpose of the Closure function is to close SST and DST tank farms and RPP facilities. Closure of tanks and tank farms assumes that waste retrieval will remove sufficient waste from the tanks that the residual wastes following retrieval, the tanks themselves, the tank farm ancillary equipment, and the contaminated soil will be disposed in place in accordance with applicable regulations and agreements. This strategy also assumes that the residual waste and other tank farm source terms will be considered by the U. S. Nuclear Regulatory Commission to be incidental waste, i.e., non-high-level waste. This function has substantial involvement with studies directed at understanding contaminant migration in the vadose zone and groundwater that are part of the Hanford Groundwater/Vadose Zone (GW/VZ) Integration Project.
12	***Need/Problem Description*:** The Environmental Impact Statement (EIS) for the River Protection Project (formerly Tank Waste Remediation System) evaluated waste retrieval and disposal alternatives, but did not evaluate tank farm closure alternatives because sufficient information was not available. The Record of Decision for the EIS committed to conducting a NEPA process for decisions on tank farm closure, when sufficient additional information was available on waste retrieval performance, closure technology, and vadose zone conditions. The purpose of waste retrieval from single-shell tanks (SSTs) is to prepare tanks for closure. Until decisions on closing tank farms are made, final requirements for SST waste retrieval cannot be specified. This includes requirements for allowable residual waste in SSTs following completion of retrieval. Unless a default value of zero leakage during retrieval is specified as an interim requirement, final requirements for leakage control during retrieval also are constrained by decisions on how tank farms will be closed, since closure decisions include decisions on remediation of soil potentially contaminated by retrieval leaks. Tri-Party Agreement milestones for characterizing the vadose zone in SST waste management areas (WMAs) under RCRA assessment have been established. Phase 1 of the required investigations are scheduled to be completed in FY 2004, with recommendations for additional subsurface investigations that may be required to support decisions on waste retrieval and closure. Presently, criteria for making closure decisions (e.g., quantitative measure(s) of compliance, points of compliance, period of compliance, exposure scenarios) have not been finalized, although criteria are required to be established under the recently adopted

	exposure scenarios) have not been finalized, although criteria are required to be established under the recently adopted Tri-Party Agreement milestones as a basis for determining what subsurface data should be collected. In addition, no criteria have been established to guide the decision due in FY 2004 on whether additional subsurface data may be needed in a second phase of subsurface investigations in the SST WMAs under RCRA assessment. Because subsurface investigations in contaminated tank farm soils are expensive, an approach is needed for determining when enough information has been gathered to support decisions on closure. Furthermore, decision analysis is needed in support of alternative land use and regulatory modeling cases, including public information and polling studies to determine stakeholder acceptance of alternatives. Many of the risk assessments conducted to date are performed in a deterministic manner using best knowledge of parameter values. In reality, the parameters have a fair amount of uncertainty due to the complicated nature of the tank wastes, release mechanisms, fate and transport, and overall environmental setting. Consequently, stochastic or probabilistic methods are needed in risk assessments to consider parameter sensitivities and uncertainties. Once parameter distribution ranges are determined, Monte Carlo modeling methods with Latin Hypercube sampling techniques, or other suitable modeling approaches, can be used to conduct probabilistic analyses. Such probabilistic analyses can also be useful in extrapolating data and information from one tank farm to another by demonstrating that the sensitive parameters fall within parameter distribution ranges. Furthermore, decision support tools capable of probabilistic analyses can be used to evaluate alternative land use scenarios and regulatory modeling cases in support of defensible, risk based decisions. Such analyses can be used to provide a risk basis for developing consensus regarding approaches to site cleanup and closure that are protective of human health and the environment. **Consequences of Not Filling Need:** Decisions on subsurface data collection and other data collection activities required in support of tank waste retrieval and closure decisions will be more arbitrary than necessary. More data may be collected at higher cost than is actually required for decision-making. Initiation of the closure decision process may be delayed longer than needed. More SST retrieval demonstrations may be conducted than are necessary for closure decision-making, with the increased risk that some may have to be re-retrieved in a second phase to meet final closure requirements. Decisions may be made to retrieve wastes when risk based decision analyses would support in-place isolation and stabilization of wastes with modifications to land use scenarios and regulatory framework, as appropriate and necessary. ** **Program Baseline Summary (PTS) No.:** RL-TW11 ** **Work Breakdown Structure (WBS) No.:** 5.02.01.01.02.02 ** **TIP No.:** TBD
13	***Functional Performance Requirements:*** The decision analysis methodology will need to consider the value of gathering additional information on subsurface conditions, retrieval performance, and closure technology (relevance to their importance in selecting a tank farm closure alternative), and the cost of gathering such information. The decision analysis methodology will need to account for uncertainty, and the likely reduction in uncertainty that would result from gathering additional data. The decision analysis methodology will need to consider and make recommendations on alternative approaches to account for uncertainty, including expert elicitation. The decision analysis methodology will need to identify the closure decision-makers, and develop recommendations on how and when to involve the closure decision-makers in reaching consensus on the approach for determining when sufficient information has been gathered to reach the decision on proceeding with a NEPA process for closure. Decision support tools should also be used to compare land use scenarios, points of compliance, regulatory framework, and other considerations driving site remediation and closure decisions. The decision support tools must also be configured in a manner to support public, regulator, and stakeholder information by allowing "what if" scenarios to be run efficiently. **Outsourcing Potential:** Value of information decision analysis approaches have been developed and used successfully at other DOE Sites, national laboratories, universities, and in private industry for making capital investment decisions. Decision support tools have been successfully used by Sandia National Laboratories to license nuclear waste repositories such as the Waste Isolation Pilot Plant in Carlsbad, New Mexico.

**	**Schedule Requirements:** The data quality objectives process and preparation of work plans for the Phase 1 site-specific subsurface investigations and retrieval system designs are planned over the period FY 1999 through FY 2005. Decision analysis methodology, if developed within this time frame, would provide input to definition of subsurface data needed during these Phase I investigations. At the latest, decision analysis methodology must be available for preparation of the RFI Report scheduled to be developed from late FY 2003 through the first half of FY 2004 to meet one of the recently adopted Tri-Party Agreement milestones. By this time, additional retrieval performance data should be available from planned retrieval projects at Hanford, as well as waste retrieval activities at other DOE sites. In addition, by this time additional information on tank closure technology should be available from closure activities at other DOE sites. Capabilities for sensitivity and uncertainty analyses are needed immediately in support of retrieval system designs. Retrieval release criteria and target leak detection rates are determined by the RPE Methodology. The RPE Methodology is currently a deterministic, risk-based method that considers past tank leaks, potential leakage losses during retrieval, and residual waste inventories. All of these considerations have uncertainties associated with waste inventories, release mechanisms, fate and transport, and other considerations that are modeled in the risk assessment. Decision support tools capable of modeling alternative land uses and regulatory cases are needed immediately in support of site cleanup and closure decisions to ensure cost-effective actions that are risk based. Furthermore, these tools can be used effectively in support of public, regulator, and stakeholder information to understand the minimum necessary to adequately protect human health and the environment.
14	***Definition of Solution*:**
15 *	***Targeted Focus Area*:** Tanks Focus Area (TFA) and Subsurface Contaminants Focus Area (SCFA)
16	***Potential Benefits*:**
17 *	***Potential Cost Savings*:** $350,000,000
18 *	***Potential Cost Savings Narrative*:** Phase 1 of the planned investigation of SST WMAs under RCRA assessment is estimated to cost in excess of $30 million over the period FY 1999 through FY 2004. A subsequent phase to gather additional subsurface information can be expected to cost a comparable amount. Retrieval costs per SST to satisfy the M-45 Series of Tri-Party Agreement milestones can be expected to cost on the order of $20-$30 million per tank. If a second or third phase of subsurface investigations can be avoided based on application of value of information methodology, or focused on only that information needed for decision-making, the savings could be on the order of tens of millions of dollars. Similarly, if closure decisions can be supported after only a small number of SST retrieval demonstrations, tens of millions of dollars per SST can potentially be saved in retrieval of residual waste remaining after completion of retrieval demonstration in the event closure requirements that were ultimately established turn out to require more extensive retrieval than was accomplished during the retrieval demonstrations. Furthermore, if waste retrieval is required only to the extent indicated by a probabilistic risk-based evaluation for closure, then savings on the order of $5 million per tanks can be realized for roughly 70 tanks that are essentially empty or contain special case wastes (lower than Class C).
**	***Technical Basis*:** A quantitative approach is needed for determining when sufficient data is available to proceed with the required NEPA process for tank farm closure, i.e., a methodology is needed for determining when gathering additional information is unlikely to change the decision. Value of Information (VOI) approaches will quantify the expected value of additional information that is relevant to closure decisions, and will provide a defensible methodology for prioritizing characterization work and optimizing retrieval system and site closure designs. Thus, it will not only be possible to know when it is no longer cost effective or necessary to gather additional information for closure; it will also enable managers to identify what characterization activities are most cost effective for improving the quality of RPP decisions that impact closure. Thus, VOI also becomes a valuable adjunct to planning a cost effective characterization program. **Other:** There are no current commitments to DOE to perform value of information decision analysis as a basis for determining when sufficient information is available to proceed with a NEPA process for closure. However, DOE's Record of Decision for the RPP EIS that committed to proceeding with a closure decision process when sufficient information is available implies a requirement for application of decision analysis methodology in order to determine when in fact sufficient information is available.

19		***Cultural/Stakeholder Basis*:** Expressed stakeholder values include adopting a systems approach in cleanup decisions, and getting on with waste retrieval and closure in a timely manner that protects human health and the environment. Value of information decision analysis methodology will help to focus expensive data gathering activities on retrieval and closure decision-making, and will help decision-makers recognize when enough information has been gathered to make those decisions. Such an approach is advocated by the Columbia River Comprehensive Impact Assessment, prepared by representatives of regulators, Tribal Nations, and stakeholder groups, to focus data gathering efforts based on system elements determined to be "dominant".
20		***Environment, Safety, and Health Basis*:** The NEPA process for making evaluating alternatives and making decisions on tank farm closure will consider health and safety impacts to workers and the public from routine operations and accidents. The value of information decision analysis methodology will need to also address when sufficient information is available to evaluate worker and public health and safety impacts.
21		***Regulatory Drivers*:** The Record of Decision for the RPP EIS (62 FR 8693) requires a decision to proceed with a NEPA process for tank farm closure, when sufficient information is available. Tri-Party Agreement Milestone M-45-55 requires preparation of an RFI Report with recommendations on the need for additional subsurface investigations to support decisions on waste retrieval and closure. The Change Control Form (M-45-98-03) for these Tri-Party Agreement milestones requires determination that no additional subsurface information is needed prior to conducting a NEPA process for closure, which must be completed prior to preparing a tank farm Closure Plan. Tri-Party Agreement milestone M-45-06-T01 requires preparation and submittal of a RCRA closure plan that must be approved prior to initiation of closure activities. Tri-Party Agreement milestone M-45-06 requires closure of SST farms over the period FY 2012 through FY 2024. The interim and target Tri-Party Agreement milestones under M-45-03 and M-45-04 require demonstration of retrieval technology first in a tank (C-106), and subsequently in a tank farm or equivalent number of tanks to provide the basis for finalizing a retrieval performance requirement for closure. The M-45 Series of TPA milestones also call for the preparation of Functions & Requirements (F&Rs) in support of retrieval and LDMM system designs. Retrieval Performance Evaluation (RPE) Methodology calculations are performed in support of F&R documents to determine risk-based retrieval release criteria and target leak detection rates as a function of past tank leaks, potential leakage losses during retrieval, and residual wastes inventories.
22	*	***Milestones*:** T04-01-W21, M-45-55-T01, M45-55-T02, T04-04-W18, T04-04-W19, T04-18-1B1, T04-24-051, T04-24-052
23	*	***Material Streams*:** Sludge, Salt, Liquid (RL-HLW-20) ID-3857 HLW to Treatment Risk Score: 3
24	*	***TSD System*:** Single Shell Tank Systems
25		***Major Contaminants*:** Pu-238, -239, -240, -241; Am-241; U-238; C-14; Ni-59/63; Nb-94; Tc-99; I-129; Cm-242; Sr-90; Cs-137; Sn-126; Se-79; chromium; nitrate; nitrite; complexants (EDTA/HEDTA).
26		***Contaminated Media*:** Tanks wastes consisting of high molarity sodium hydroxide/sodium nitrate solution containing saturated saltcake and/or sludge, and vadose zone soils.
27		***Volume/Size of Contaminated Media*:** Nominal capacities of the tanks is 55,000 to 1,000,000 gallons. The single shell tanks are generally 75 ft. in diameter, and up to 40 feet deep with their tops buried about 10 feet below the ground surface.
28	*	***Earliest Date Required*:** 9/30/01
29	*	***Latest Date Required*:** 9/30/06
Baseline Technology Information		
30		***Baseline Technology/Process*:** Value of information decision analysis approaches have been used successfully at other sites, including for example at the Waste Isolation Pilot Plant to make decisions on continuation or termination of planned R&D efforts that constrained license application for the repository. Current risk assessment approaches use deterministic methods with single "best-basis" values. In reality, sensitive parameters are uncertain with parameter distribution ranges. Capabilities for probabilistic analyses allow uncertainties to be captured and factored into analyses in support of retrieval and closure decisions. **Technology Insertion Point(s):** N/A
31		***Life-Cycle Cost Using Baseline*:**

32	***Uncertainty on Baseline Life-Cycle Cost*:**
33	***Completion Date Using Baseline:***
Points of Contact (POC)	
34	***Contractor End User POCs*:** T.L. (Terry) Sams, CHG, 509-373-0417, F/509-372-3983, Terry_L_Sams@rl.gov
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36 *	***Other Contacts:*** J.W. (Jerry) Cammann, CHG, 509-372-2757, F/509-373-6101, Jerry_W_Cammann@rl.gov; K.A. (Ken) Gasper, CHG, 509-373-1948, F/509-376-1788, Kenneth_A_Ken_Gasper@rl.gov

*Element of a Site Need Statement appearing in IPABS-IS
**Element of a Site Need Statement required by CHG